

Applicant hereby amends pending claim 1 to address the informalities noted by the Examiner and the rejection posed by the Examiner. Applicant respectfully requests the Examiner to enter each amendment set forth in this Amendment and favorably consider the accompanying Remarks.

In the Claim

(Marked-Up Version Showing Changes)

We Claim:

1. (AMENDED) An antenna assembly for a communications device operating at a predetermined wavelength and having a transceiver circuit including a signal output and a ground plane, said antenna assembly comprising:
  - a first dielectric substrate element;
  - at least a pair of conductor trace elements disposed upon opposite sides of the [a] first dielectric substrate element, at least one of the pair of conductor trace elements having a one-quarter wavelength electrical length and [, and at least a pair of the conductor trace elements]
  - being capacitively coupled through the first dielectric substrate element to an other of said at least one of the pair of conductor trace elements; and
  - a second substrate element including a second conductor trace element, said second trace element being coupled to the ground plane of the transceiver circuit, and said second substrate element being in substantially perpendicular relationship to said first dielectric substrate element
  - wherein said at least a pair of conductor trace elements are resonator structures which transmit and receive electromagnetic radiation from a remote source.

**Clean Version of Pending Claim for Examination**

We Claim:

1. An antenna assembly for a communications device operating at a predetermined wavelength and having a transceiver circuit including a signal output and a ground plane, said antenna assembly comprising:
  - a first dielectric substrate element;
  - at least a pair of conductor trace elements disposed upon opposite sides of the first dielectric substrate element, at least one of the pair of conductor trace elements having a one-quarter wavelength electrical length and being capacitively coupled through the first dielectric substrate element to an other of said at least one of the pair of conductor trace elements; and
  - a second substrate element including a second conductor trace element, said second trace element being coupled to the ground plane of the transceiver circuit, and said second substrate element being in substantially perpendicular relationship to said first dielectric substrate element
- wherein said at least a pair of conductor trace elements are resonator structures which transmit and receive electromagnetic radiation from a remote source.

Remarks

Claim 1 is presently pending in this application. This Amendment herewith amends pending claim 1 for continued examination on the merits. A marked-up version of the proposed amendment to pending claim 1 appears hereinabove and a clean version of pending claim 1 as amended appears immediately above. Favorable consideration of this Amendment is earnestly solicited to that the present application may proceed to timely issuance as U.S. Letters Patent.

Objection to the Drawings

In paragraph 1 of the Office Action, the Examiner objected to the informal drawings which were deemed acceptable for examination purposes only. Applicant notes the objection to the informal drawings and when allowable subject matter is identified in the present application, the Applicant will thereafter timely submit formal drawings.

Claim Rejections – 35 U.S.C. § 112

In paragraph 2 of the Office Action, the Examiner objected certain informalities present in pending claim 1 and required appropriate correction consistent with the requirements of U.S.C. §112, second paragraph. Applicant has addressed and corrected pending claim 1 herein.

Claim Rejections – 35 U.S.C. § 103

In paragraphs 3 and 4 of the Office Action, the Examiner rejected claim 1 under 35 U.S.C. § 103(a) as being unpatentable over Hill (U.S. Patent No. 6,107,967) in view of Zhang et al. (U.S. Patent No. 6,091,366).

The Examiner asserts that Hill discloses “a small antenna for communication device comprising a first dielectric substrate 120, a conductive trace 130 formed on a surface of the first dielectric substrate, a second dielectric substrate 110, and wherein the first dielectric substrate is perpendicular to the second dielectric substrate.” The Examiner admits that Hill does not teach an another [sic] conductive trace capacitively coupling to the conductive trace, and asserts that Zhang discloses (in FIG. 3) an antenna device having a dielectric substrate 181, a conductive trace or antenna element 183 and a microstrip line 183 [sic; should be 182] formed on a side of the dielectric substrate opposite to the antenna element.

With respect to the Zhang reference, Applicant firstly respectfully submits that FIG. 3 of Zhang depicts a prior art antenna structure and secondly asserts that Zhang does not teach or show capacitive coupling between radiating elements disposed on each side of the first dielectric substrate element (as provided in claim 1 as amended).

With respect to the Hill patent, the Hill patent shows a single-frequency-band meander line conductor which is fed at one end. In addition, the meander line of Hill is a continuous conductor whereas the Applicant's show and teach use of a tri-band meander line circuit. Applicant strongly suggests that the tri-band meander line circuit is not made obvious with reference to the Hill circuit and neither Hill nor Zhang provide any suggestion or motivation to implement capacitive coupling nor to implement a tri-band meander line.

Furthermore the single-frequency meander line conductor or Hill is fed simply at one end of the meander line, against a second conductor, to form a single band antenna. No provision is made for impedance matching to various feedline impedances. Whereas as can be seen in FIG. 5 of the Applicant's patent disclosure a dual-band shunt feed system, where the coax shield connects to an end of the meander at 144, and the coax center conductor connects to a distant tap point 146. This system allows the antenna circuit to be matched to a variety of feedline impedances, by adjusting tap point 146, while also allowing two frequency bands to be fed by a single feedline 70. In addition, again with reference to FIG. 5 of the present invention, a shunt feed system for a third band, with ground connection 148 and tap point 150 is depicted.

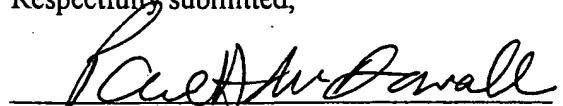
With further reference to the Zhang patent reference, this reference merely shows a microstrip feedline which feeds energy to a dipole antenna. The dipole is a single conductor antenna. The Zhang patent does not feed a resonator as in the present invention, but rather merely feeds directly to a dipole radiator. In FIG. 3 of the present invention a  $\frac{1}{4}$  wavelength resonator 26 is fed by a microstrip line 28b. The  $\frac{1}{4}$  wavelength resonator requires a second conductor 20 to make a complete, operable antenna. Conductor 20 connects to the outer shield of coax line 70, and the center conductor connects to the microstrip line 28b. Furthermore, Zhang shows a single-band antenna while the present invention (at FIG. 4) teaches a quadruple-band antenna, with resonators 14 and 54, electrically coupled to a common second conductor 20.

The Examiner is respectfully requested to reconsider and withdraw the rejection based on Hill and Zhang. As neither Hill nor Zhang, alone or in combination, describes or even suggests

the subject matter claimed in the present application. Nothing in the prior art cited by the Examiner teaches or contemplates such subject matter.

Should the Examiner wish to discuss this application further, the Examiner is invited to contact the Applicant's attorney at the number provided below.

Respectfully submitted,

  
\_\_\_\_\_  
Paul H. McDowall, Reg. No. 34,873  
LARKIN, HOFFMAN, DALY & LINDGREN, LTD.  
1500 Wells Fargo Plaza  
7900 Xerxes Avenue South  
Bloomington, Minnesota 55431  
[pmcdowall@lhd.com](mailto:pmcdowall@lhd.com) (e-mail)  
(952) 896-3220 (direct)  
(952) 896-3333 (fax)

Dated: October 25, 2001